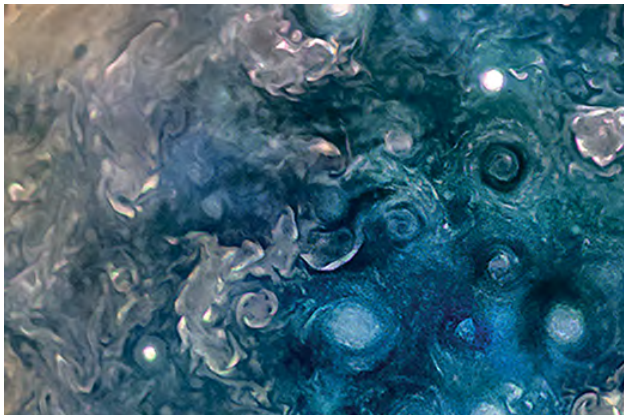


SCIENCE

National Aeronautics and
Space Administration



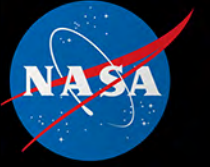
NASA SCIENCE MISSION DIRECTORATE Opportunities for Engagement

Ellen Gertsen, Executive Officer
Kartik Sheth, Program Scientist
Michael Seablom, Chief Technologist
Hakeem Oluseyi, Distinguished Research Professor

March 27, 2018

Agenda

- Science Mission Directorate Overview
- Research Opportunities in Space and Earth Sciences (ROSES)
- Technology Programs for Science
- Science Activation
- “How To” Guide for Applications



NASA SCIENCE

Doing the **IMPOSSIBLE**



Discovering Secrets
of the Universe



Searching for Life in the
Solar System and Beyond



Safeguarding and
Improving Life on Earth



BE A LEADER IN SCIENCE

PROTECT & IMPROVE
LIFE ON EARTH

DISCOVER SECRETS
OF THE UNIVERSE

FOCUS ON IMPACT

SEARCH FOR
LIFE ELSEWHERE



ENABLE INNOVATION

COMMERCIAL
PARTNERS

INTERNATIONAL
PARTNERS

BE INTERCONNECTED

ACROSS THE AGENCY

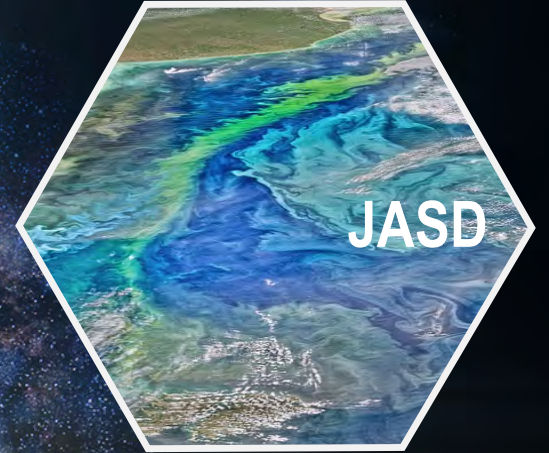


INSPIRE LEARNERS
OF ALL AGES



NASA Science Mission Directorate

An Integrated Program
Enabling Great Science



Science by the NUMBERS



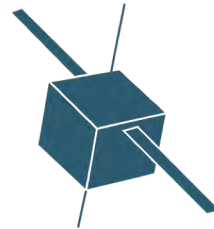
**TECHNOLOGY
INNOVATION**
~\$400M Invested Annually



RESEARCH
~10,000 U.S. Scientists Funded
~3,000 Competitively Selected Awards
~\$600M Awarded Annually



SPACECRAFT
106 Missions
88 Spacecraft



CUBESATS
21 Science Missions
15 Technology Demos



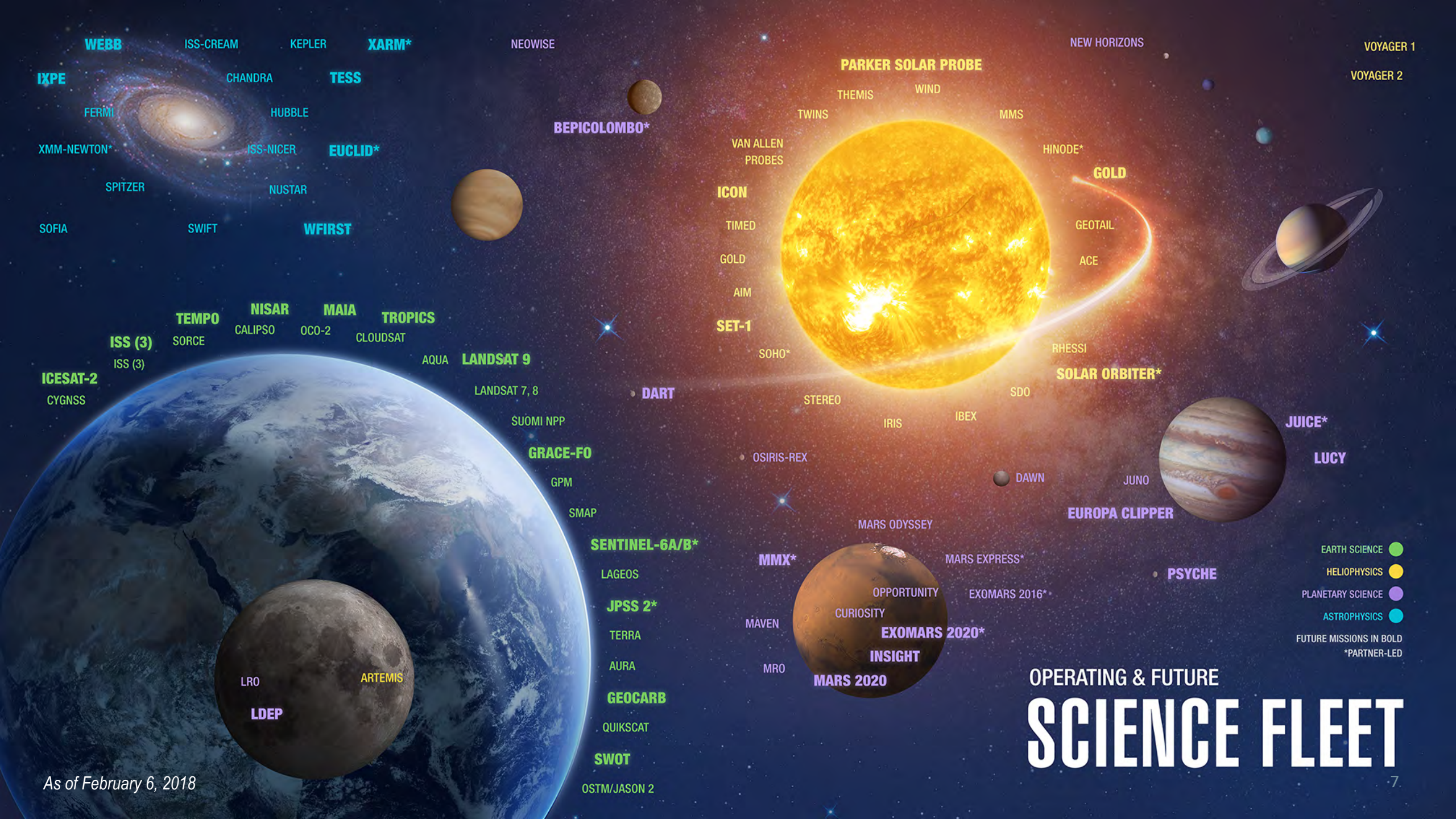
SOUNDING ROCKETS
16 Science Missions
3 Tech/Student Missions



**EARTH-BASED
INVESTIGATIONS**
25 Major Airborne Missions
8 Global Networks



BALLOONS
13 Science Payloads
1 HASP with up to
12 student experiments



As of February 6, 2018

OPERATING & FUTURE SCIENCE FLEET

Agenda

- Science Mission Directorate Overview
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What is ROSES?

- It is the name for an omnibus NASA Research Announcement (NRA)
- Always released on Valentine's Day, February 14
- Basic and Applied Research in support of NASA's Science Mission Directorate (SMD)
- Contains many individual program elements, each with its own due date and topics

ROSES Awards and Funding information

- **Awards:** ~1,150 out of ~4800 proposals selected each year equal to ~\$600M over the lifetime of the award
- **Organizations:** ~60% to universities / non-profits with ~30% to NASA centers
- **Award Size:** < \$100K per year – > \$1M per year
- **Peer Reviewed:** Based on merit, relevance, and level of effort, >15 page proposals, usually submitted by institution; selections announced up to six months after submission
- **Award Mechanism:** Typically grants for universities and non profits, but also cooperative agreements, contracts, etc.
- **Duration:** Typically three years but can be up to five

ROSES Appendix A: Earth Science Research Program

- Supports research activities that address the Earth system and seek to characterize its properties on a broad range of spatial and temporal scales, to understand the naturally occurring and human-induced processes that drive them, and to improve our capability for predicting its future evolution
- Informed by 2017 Decadal Survey: *Thriving on our Changing Planet: A Decadal Strategy for Earth Observation from Space*
- 18 program elements accepting proposals for 2018



ROSES Appendix B: Heliophysics Research Program

- Seeks to understand phenomena, on a broad range of spatial and temporal scales, the fundamental processes that drive them, how these processes combine to create space weather events, and to enable a capability for predicting future space weather events
- Informed by 2013 Decadal Survey: *Solar and Space Physics: A Science for a Technological Society*
- 11 program elements accepting proposals for 2018



ROSES Appendix C: Planetary Science Research Program

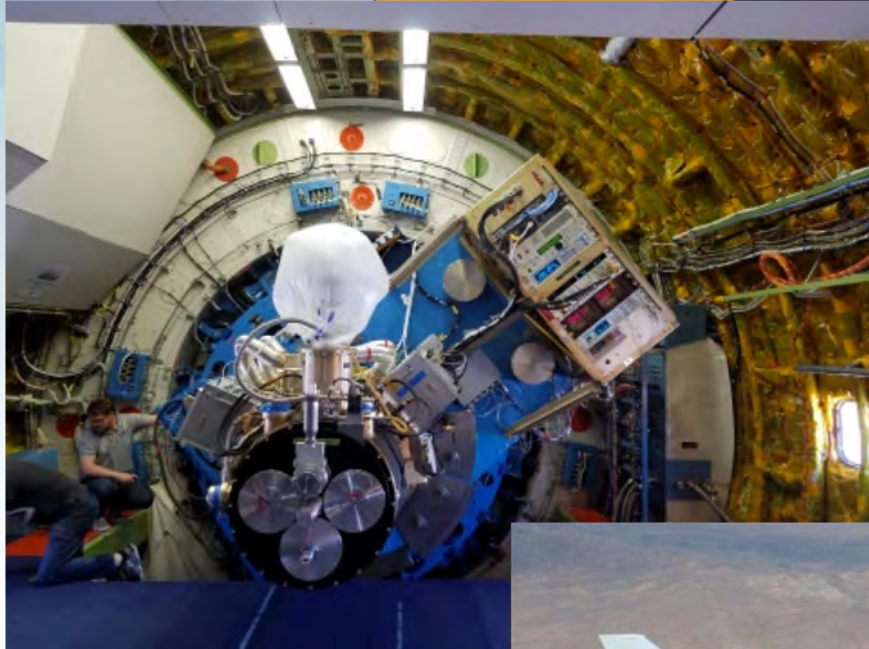


- Supports investigations to help ascertain the content, origin, and evolution of the Solar System and the potential for life elsewhere
- Informed by 2011 Decadal Survey: *Visions and Voyages for Planetary Science*
- 20 program elements accepting proposals for 2018

ROSES Appendix D: Astrophysics Research Program

- Seeks to discover how the universe works, explore how it began and evolved, and search for life on planets around other stars
- Informed by 2010 Decadal Survey: *New Worlds, New Horizons in Astronomy and Astrophysics*
- 13 program elements accepting proposals for 2018
- D.14 SOFIA Next Gen Instrumentation – my first one!





NASA Research Announcement

SOFIA Next Generation Instrumentation

Solicitation: NNH18ZDA001N-SOFIA

Dates

Release	Feb 14, 2018
Close	Aug 01, 2018

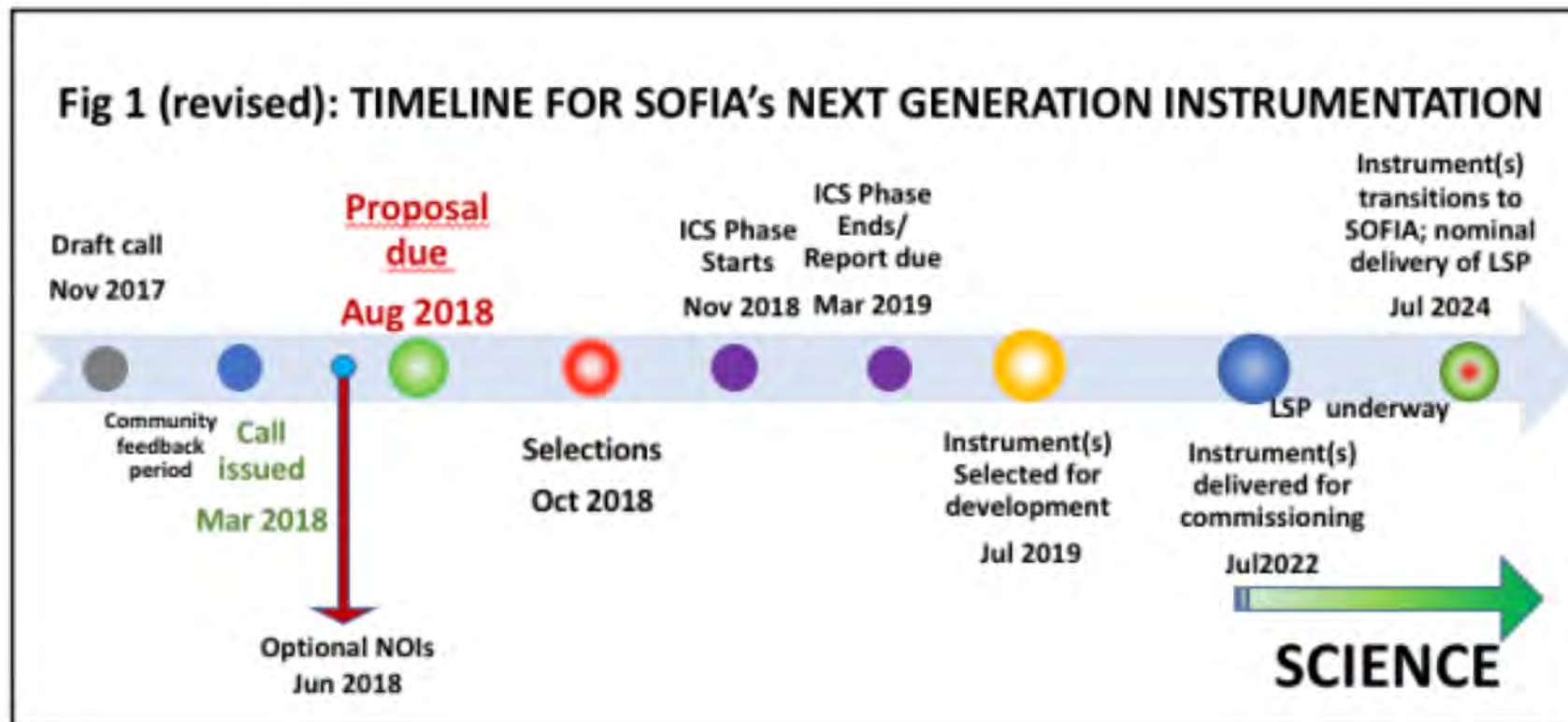
Announcement Documents

- > **DUE DATES:** Table 2 lists all program elements in due date order (.HTML)
- > **DUE DATES:** Table 3 lists all program elements in appendix order (.HTML)
- > **ROSES 2018 Summary of Solicitation (.PDF)**
- > **Complete ROSES 2018 NRA as amended and clarified (.PDF)**
- > **D.1 Astrophysics Research Program Overview (.PDF)**
- > **D.14 SOFIA Next Generation Instrumentation as amended (.PDF)**



D.14 Program Information

- **Expected total program budget:** \$15 – 20M over three years (higher values need adequate justification)
- **Number of new awards:** One or more proposals selected to conduct ICS
- **Maximum duration of awards:** ICS phase to be approximately 5 months; the schedule for implementation and delivery of the selected instrument will be determined during the ICS
- **Dates for Pre-proposal Workshops:** Tuesday, April 3, 2018 at 2pm ET; Monday, April 16, 2018 at 4pm ET; Thursday, May 17, 2018 at 2pm ET





ROSES Appendix E: Cross-Division Research

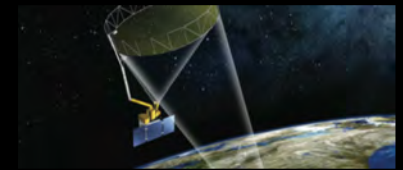
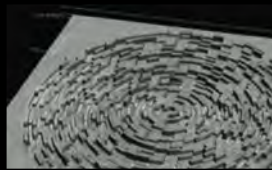
- Applies across more than one of the four science research areas
- 3 program elements accepting proposals for 2018, including research on exoplanets and habitable worlds

Agenda

- Science Mission Directorate Overview
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Technology Programs Enable NASA Science

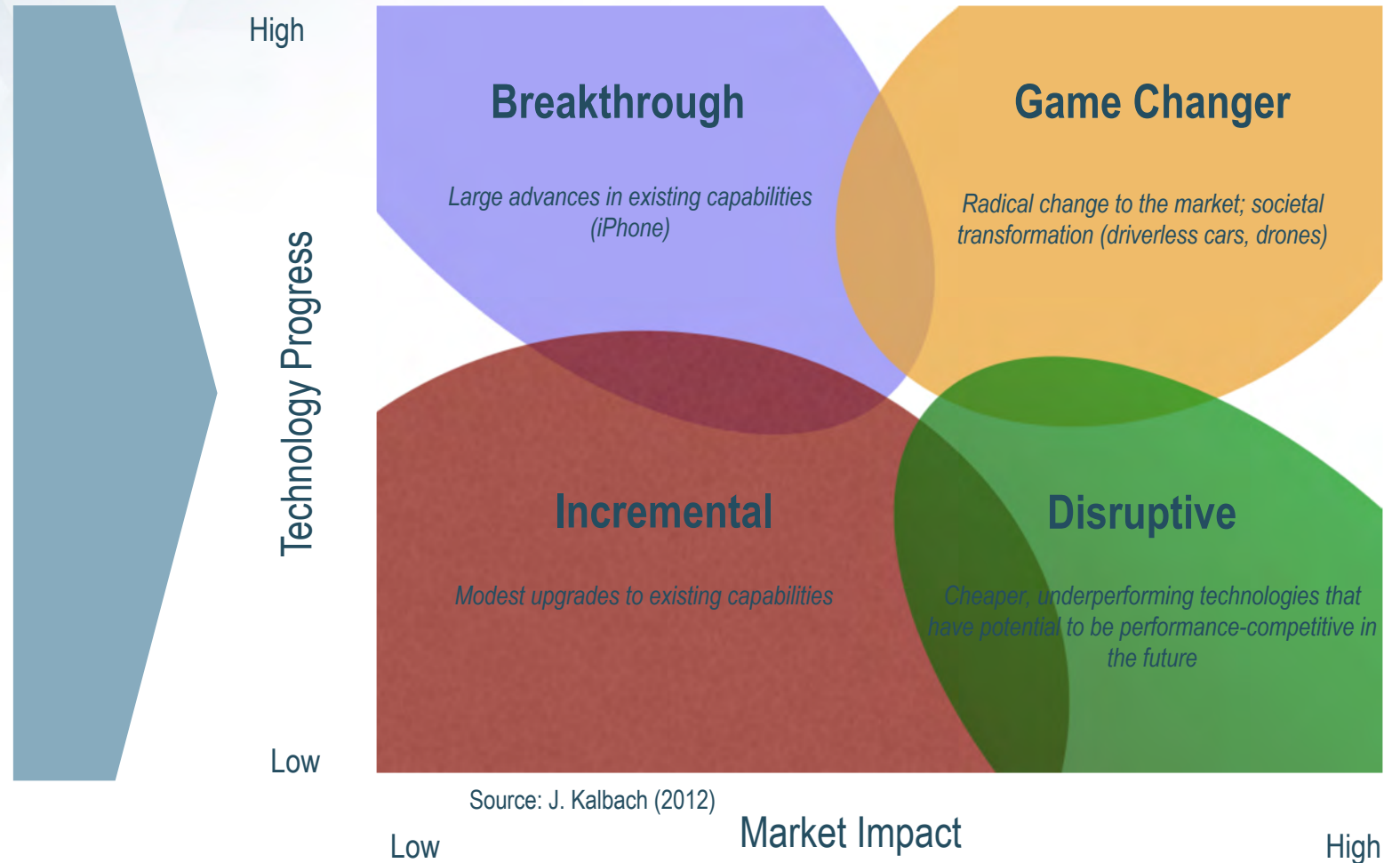
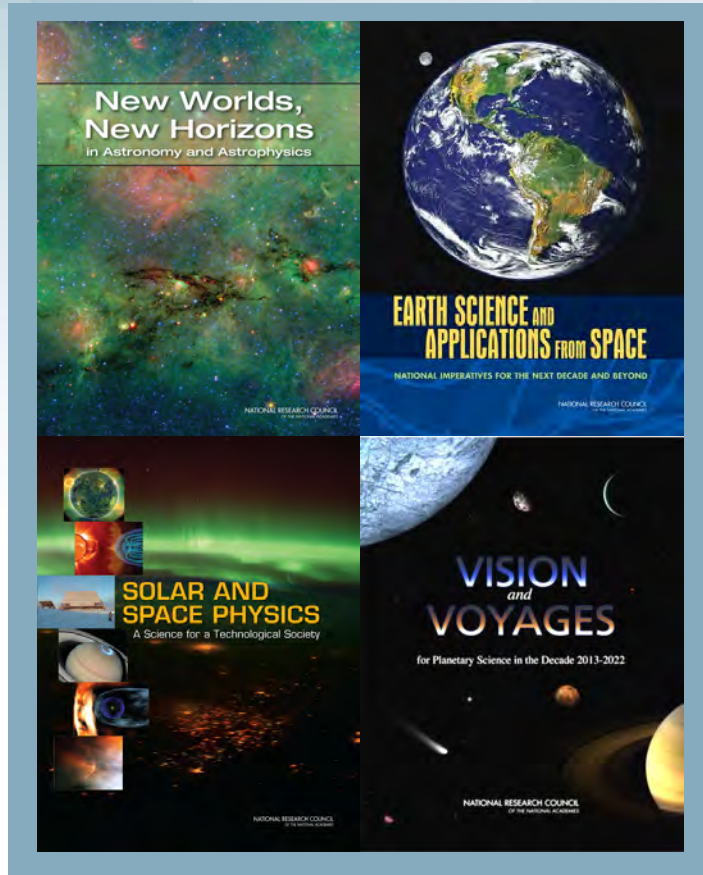
- A dozen technology programs provide over \$250 million in support annually for science instrument development in Astrophysics, Earth Science, Heliophysics, and Planetary Science
- Another 9 programs from the Space Technology Mission Directorate to support spacecraft / observing system platform technologies



Philosophy – Technology for Science

- Technology and continued technological progress is critical for the future of NASA Science and its future missions
- Technology investments are now a focus of our investment strategy for creating pathways to new flight missions
- We are actively developing flight opportunities for new technologies as part of all of our Announcements of Opportunity
- Based on our lessons learned, performance metrics, and feedback, we will continuously adjust

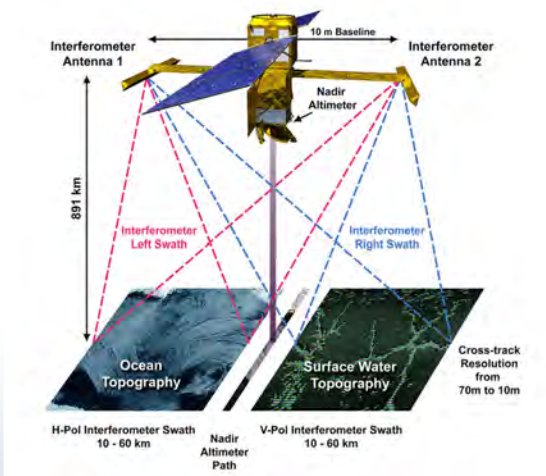
Roles of Technological Innovation



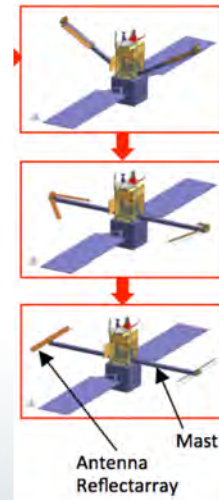
Example of “Breakthrough” Innovation

Surface Water and Ocean Topography (SWOT) Mission

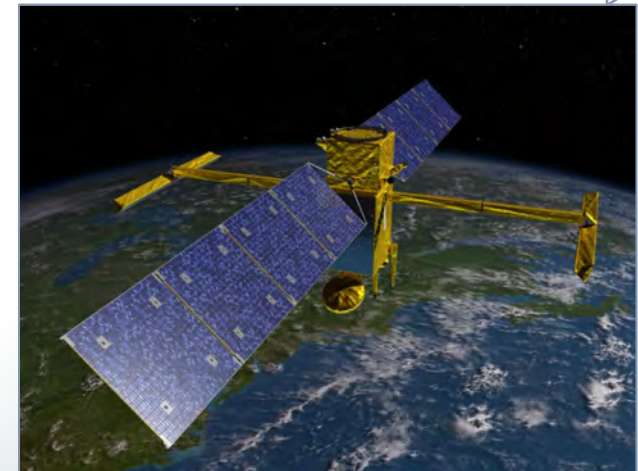
KA-BAND INTERFEROMETER



ANTENNA MAST



SWOT



Enabling Technology: Investments in Ka-band interferometer and precision antenna mast

Result: Unprecedented swath measurements of terrestrial water heights and sea surface heights (SWOT to launch in 2020)

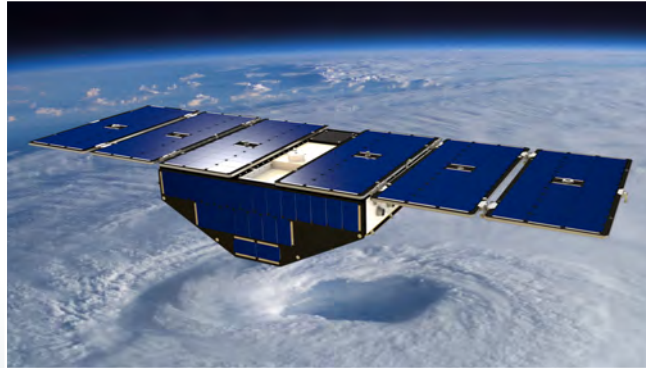
Example of “Disruptive” Innovation

Cyclone Global Navigation Satellite System (CYGNSS)

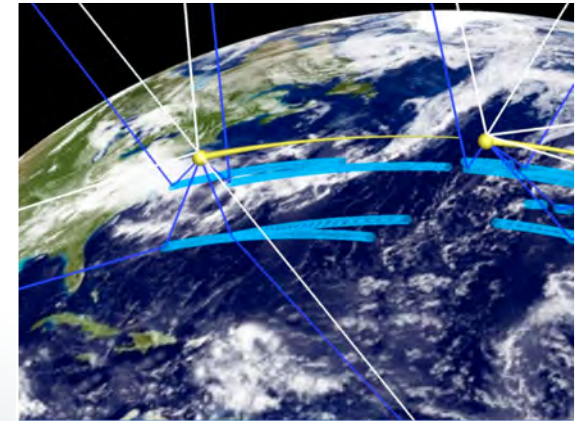
DELAY MAPPING RECEIVER



CYGNSS



FREQUENT & ACCURATE MEASUREMENTS



Enabling Technology: Existing technology (delay mapping receiver) deployed in an unique constellation of 8 LEO spacecraft

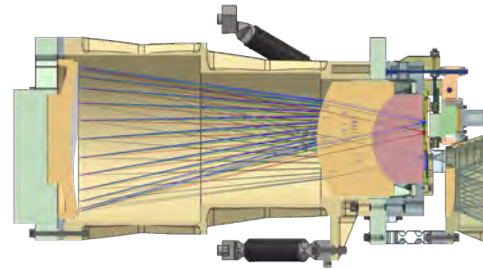
Result: Frequent and accurate measurement of ocean surface winds will improve tropical cyclone forecasting

Example of “Game Changing” Innovation

HIGH MASS (700KG)
HIGH POWER (700W)

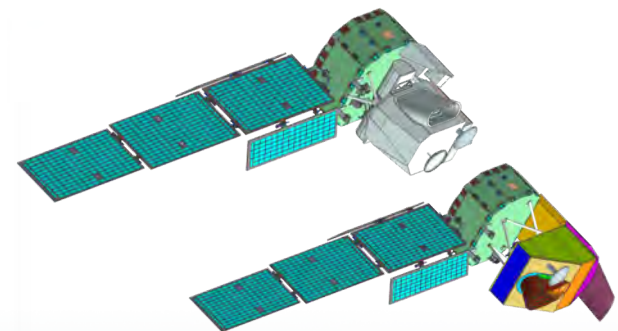


NEW SPECTROMETER



Enables a lower-cost, small satellite constellation mission

LOW MASS (155KG)
HIGH POWER (380W)



Enabling Technology: Investment in new spectrometer (Dyson replaces Offner)

Result: Small satellite constellations are the new paradigm for future hyper spectral imaging missions

NASA Science – Technology Programs

Earth Science

Advanced Component Technologies (ACT)

Develops a broad array of components and subsystems for instruments and observing systems.

Instrument Incubator Program (IIP)

Funds innovative technologies leading directly to new Earth observing instruments, sensors, and systems.

Advanced Information Systems Technology (AIST)

Develops tools and techniques to acquire, process, access, visualize, and otherwise communicate Earth science data.

In-Space Validation of Earth Science Technologies (InVEST)

Enables on-orbit technology validation and risk reduction for small instruments and instrument systems that could not otherwise be fully tested on the ground or airborne systems.

Heliophysics

Sounding Rockets and Range Program

Develops new sounding rocket and range technologies; serves as a low-cost testbed for new scientific techniques, scientific instrumentation, and spacecraft technology eventually flown on satellite missions.

Heliophysics Technology and Instrument Development for Science (H-TIDeS)

Supports basic research of new technologies and feasibility demonstrations that may enable future science missions. Also supports science investigations through suborbital flights that often involve a significant level of technology development.

NASA Science – Technology Programs

Planetary Science

Planetary Instrument Concepts for the Advancements of Solar System Observations (PICASSO)

Funds the development of low-TRL technologies (TRL 1-4) leading directly to the development to new Planetary Science observing instruments, sensors and in situ systems.

Maturation of Instruments for Solar System Exploration (MatISSE)

Matures innovative instruments, sensors, and in situ system technologies (TRL 3-6) to the point where they can be successfully infused into new Planetary Science missions.

Concepts for Ocean Worlds Life Detection Technology (COLDTech)

Supports the development of spacecraft-based instruments and technology for surface and subsurface exploration of ocean worlds such as Europa, Enceladus, and Titan.

Hot Operating Temperature Technology Program (HOTTech)

Supports the development of technologies for the robotic exploration of high-temperature environments, such as the Venus surface, Mercury, or the deep atmosphere of Gas Giants.

Radioisotope Power System Program (RPSP)

Strategically invests in nuclear power technologies to maintain NASA's current space science capabilities and enable future space exploration missions.

NASA Science – Technology Programs

Astrophysics

Astrophysics Research and Analysis (APRA)

Supports basic research of new technologies (TRL 1-3) and feasibility demonstrations that may enable future science missions. Also supports science investigations through suborbital flights that often involve a significant level of technology development.

Strategic Astrophysics Technology (SAT)

Develops mid-TRL technologies (TRL 3-6). Each focused Astrophysics program manages an SAT element separate from flight projects: Technology Development for Physics of the Cosmos (TPCOS), Technology Development for Cosmic Origins Program (TCOR), and Technology Development for Exo-Planet Missions (TDEM).

Roman Technology Fellowships (RTF)

Provides opportunities for early-career astrophysics technologists to develop the skills necessary to lead astrophysics flight instrumentation development projects, and fosters career development by providing incentives to help achieve long-term positions. Develops innovative technologies that enable or enhance future astrophysics missions.

A decorative graphic on the left side of the slide consists of a grid of hexagons. Some hexagons contain images: a hurricane, a nebula, a solar flare, a view of Earth from space, and a satellite view of a hurricane. Other hexagons are empty and light blue. The background of the slide is white with faint, larger hexagonal patterns.

Agenda

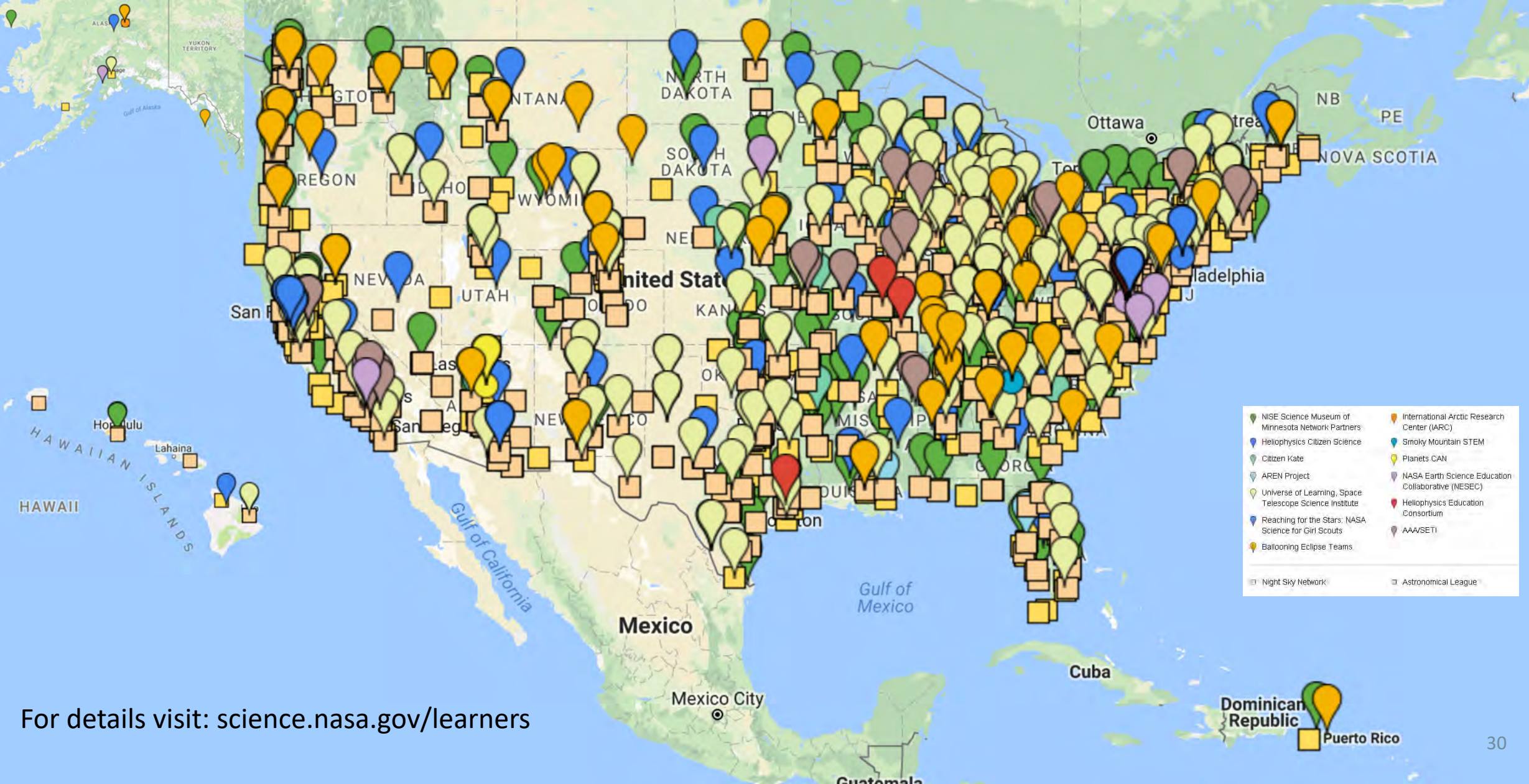
- Science Mission Directorate Overview
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- Technology Programs for Science
- **Science Activation**
- “How To” Guide for Applications

Science Activation Strategy

- Enable NASA science experts and content to engage more effectively and efficiently with learners of all ages
- Emphasize diversity and inclusiveness and provide opportunities for minorities, students with disabilities, students at minority universities, and other underserved groups
- Leverage over 200 partnerships through network of science and community-based institutions using “multiplier effect” across U.S. to achieve objectives
- Validate performance on each award using independent evaluators
- Utilize volunteer networks, such as Solar System Ambassadors and Night Sky Network, across the country

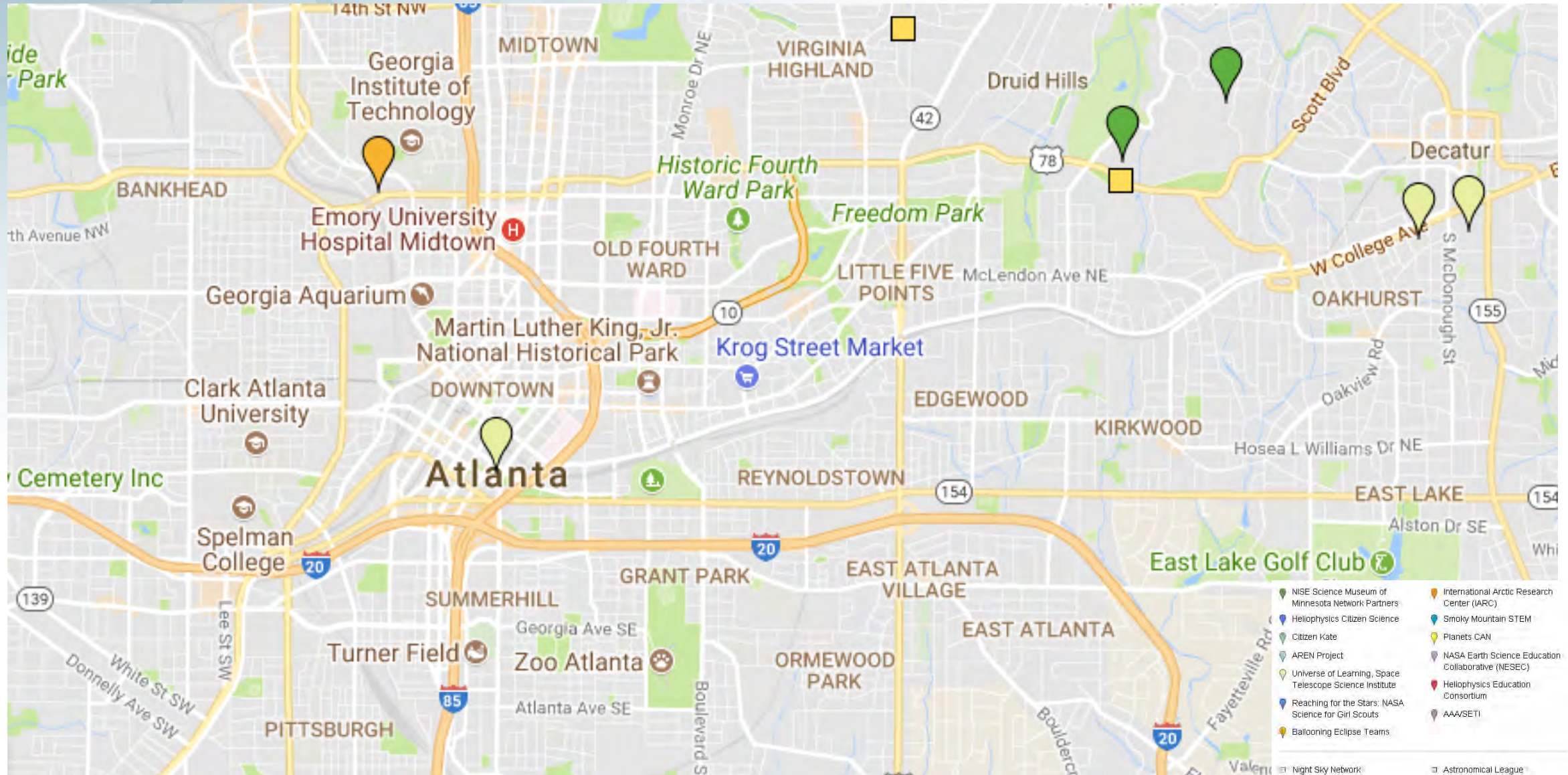


Science Activation “Reach” Extends Across U.S.



For details visit: science.nasa.gov/learners

Science Activation “Reach” in the Clark Atlanta Area



Data reflects 2016 activities



Inspire Learners

NASA Student Airborne Research Program (SARP)

- Open to rising seniors
- 8-week summer research experience
- \$5000 stipend, plus travel expenses, housing, and transportation

NASA Earth and Space Science Fellowship (NESSF)

- Open to students pursuing Masters or Doctoral degrees from an accredited US institution
- Students may be supported for up to three years
- Maximum annual stipend of \$45,000

NASA Postdoctoral Program (NPP)

- Open to US citizens, lawful permanent residents, and J-1 visa holders with a doctoral degree
- 1-3 year assignments working at NASA centers and institutes
- Annual stipend starts at \$60,000, plus \$10,000 travel allowance

Early Career Fellowships

- ROSES elements in all four science research areas for early career scientists

For additional information on these, and other opportunities, go to: <https://science.nasa.gov/learners/learner-opportunities>

A decorative graphic on the left side of the slide consists of a grid of hexagons. Some hexagons contain images: a hurricane, a nebula, a solar flare, a view of Earth from space, and a satellite view of a hurricane. Other hexagons are empty and light blue. A faint starburst is visible in the upper right background.

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NSPIRES

Main page for Researchers

- <https://sara.nasa.gov>

Main ROSES page

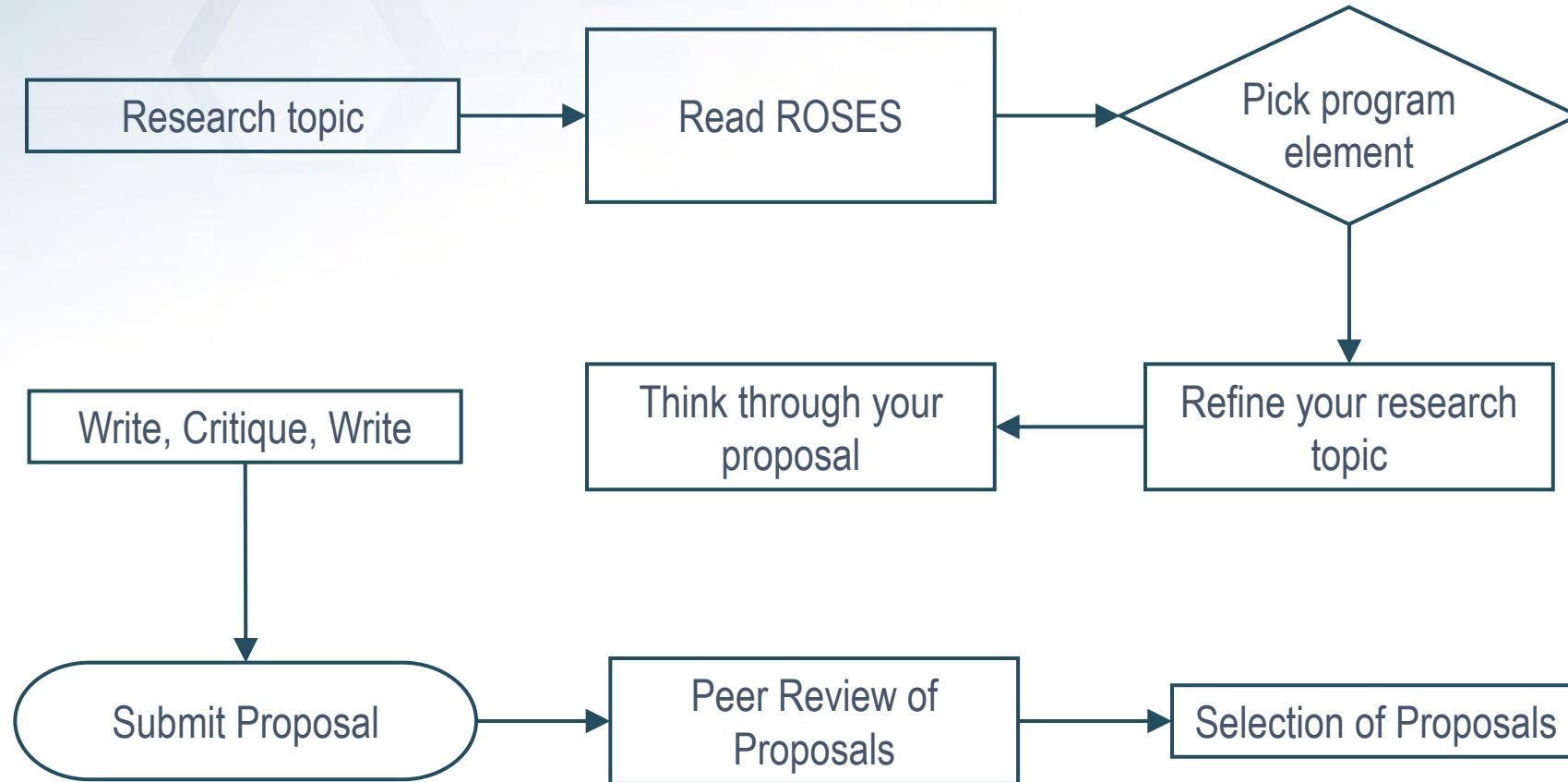
- <http://solicitation.nasaprs.com/ROSES2018>

Important information, including

- Table 2 – Due dates for all program elements
- Table 3 – Hyperlinks for all elements
- User and Organization Registration
- Past Solicitations/Successful Proposals

The screenshot displays the NSPIRES (NASA Solicitation and Proposal Integrated Review and Evaluation System) interface. The header features the NSPIRES logo and the full name of the system. The main content area is titled 'NASA Research Announcement' and 'Research Opportunities in Space and Earth Sciences 2018 (ROSES-2018)'. It specifies the solicitation number 'NNH18ZDA001N' and provides release and close dates: 'Feb 14, 2018' and 'Apr 29, 2019'. A sidebar on the left offers navigation options for 'Solicitations', 'View Solicitations', 'Future', 'Open', and 'Closed/Past Selected'. The central 'Announcement Documents' section, highlighted with a red circle, lists key documents: 'DUE DATES: Table 2 lists all program elements in due date order (.HTML)', 'DUE DATES: Table 3 lists all program elements in appendix order (.HTML)', 'ROSES 2018 Summary of Solicitation (.PDF)', 'Complete ROSES 2018 NRA as amended and clarified (.PDF)', and 'Amendments (As of: March 6, 2018)'. Below this, the 'Other Documents' section includes links for 'Clarifications and Corrections as of February 27, 2018 (.PDF)', 'Grants and Cooperative Agreement Manual (GCAM) (.DOC)', a 'Link to the page hosting the NRA or Cooperative Agreement Notice Proposers' Guidebook', and a 'Link to Proposed High-End Computing Request Template'. At the bottom, the 'Program Elements' section provides links to the 'List of Open Program Elements' and the 'List of All Program Elements'.

Writing Proposals: The Process



Additional Resources

- How-to Guide: <https://science.nasa.gov/researchers/sara/how-to-guide>
- Follow the Guidebook for Proposers:
<https://www.hq.nasa.gov/office/procurement/nraguidebook/proposer2018.pdf>
- Please consider volunteering to serve on a review panel:
<http://science.nasa.gov/researchers/volunteer-review-panels/>

Questions on ROSES18?

Contact Max Bernstein (sara@nasa.gov)

or

Program Officers Listed in ROSES

Contact Information

- Ellen Gertsen, Executive Officer ellen.gertsen@nasa.gov
- Kartik Sheth, Program Scientist kartik.sheth@nasa.gov
- Mike Seablom, Chief Technologist michael.seablom@nasa.gov
- Hakeem Oluseyi, Distinguished Research Professor hakeem.m.oluseyi@nasa.gov

A stylized illustration of an eagle with its wings spread, set against a dark blue, starry background. The eagle's body is decorated with various symbols, including a globe, a satellite, and a rocket. The text "MORE AS" and "NE" is visible on the left side.

